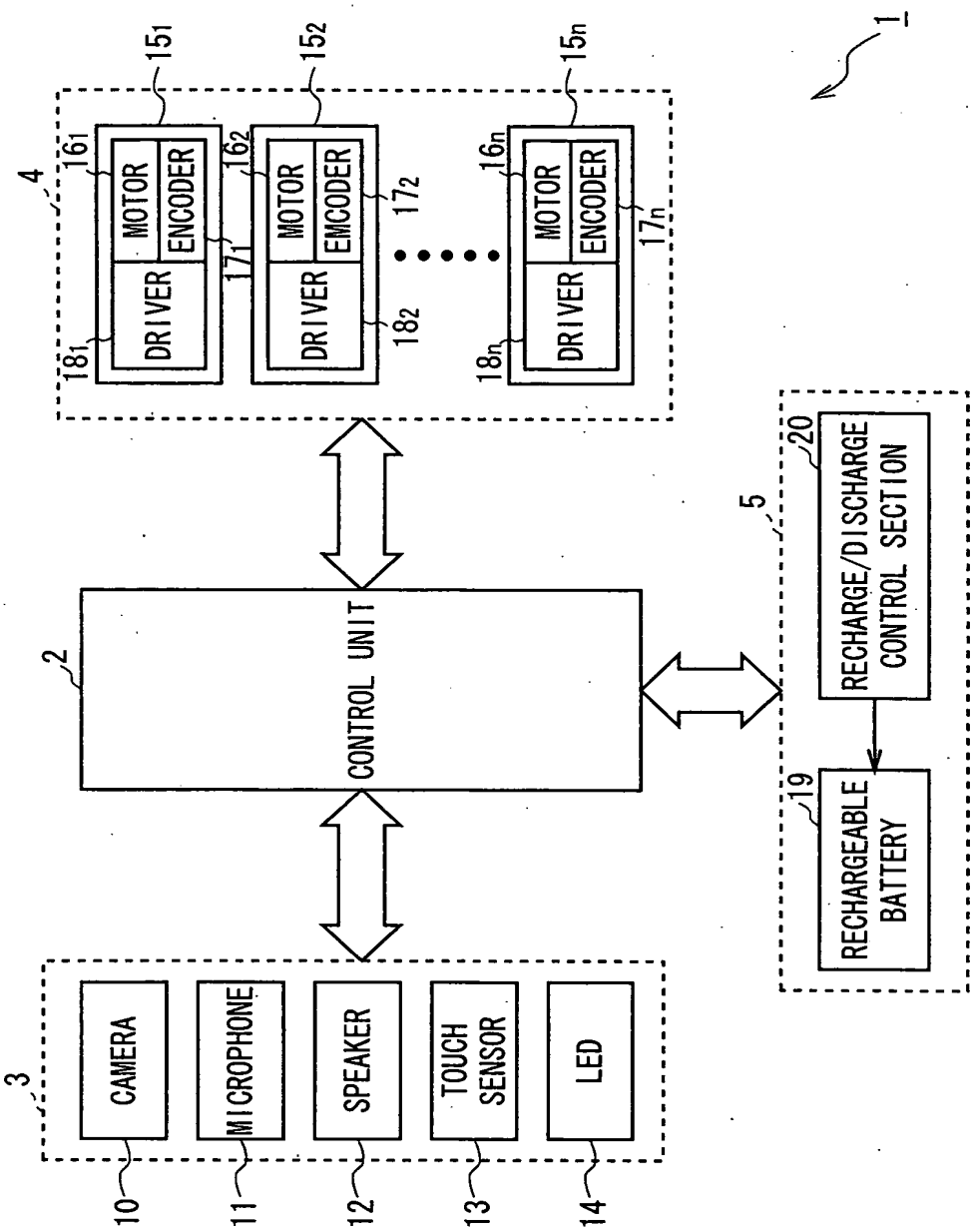
1
2
CONTROL UNIT
3
CAMERA
MICROPHONE
SPEAKER
TOUCH SENSOR
LED
10
11
12
13
14
4
15₁
15₂
15n
16₁
16₂
16n
17₁
17₂
17n
18₁
18₂
18n
MOTOR
ENCODER
DRIVER
5
19
RECHARGEABLE BATTERY
20
RECHARGE/DISCHARGE CONTROL SECTION

FIG. 1

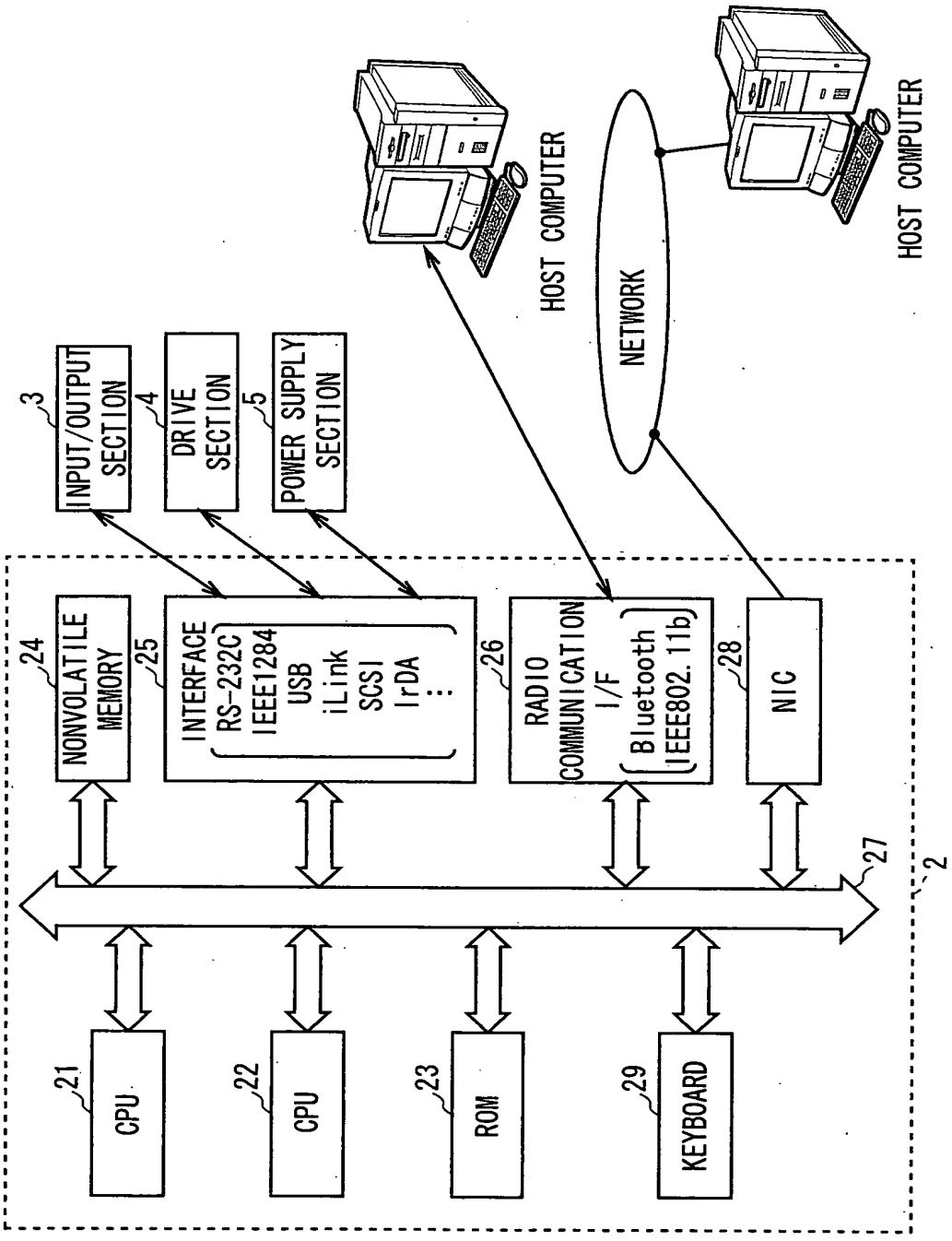
HOST COMPUTER
NETWORK
HOST COMPUTER
3
INPUT/OUTPUT SECTION
4
DRIVE SECTION
5
POWER SUPPLY SECTION
24
NONVOLATILE MEMORY
25
INTERFACE
RS-232C
IEEE1284
USB
iLink
SCSI
IrDA
26
RADIO COMMUNICATION I/F
Bluetooth
IEEE802.11b
28
NIC
27
2
21
CPU
22
CPU
23
ROM
29
KEYBOARD

FIG. 2

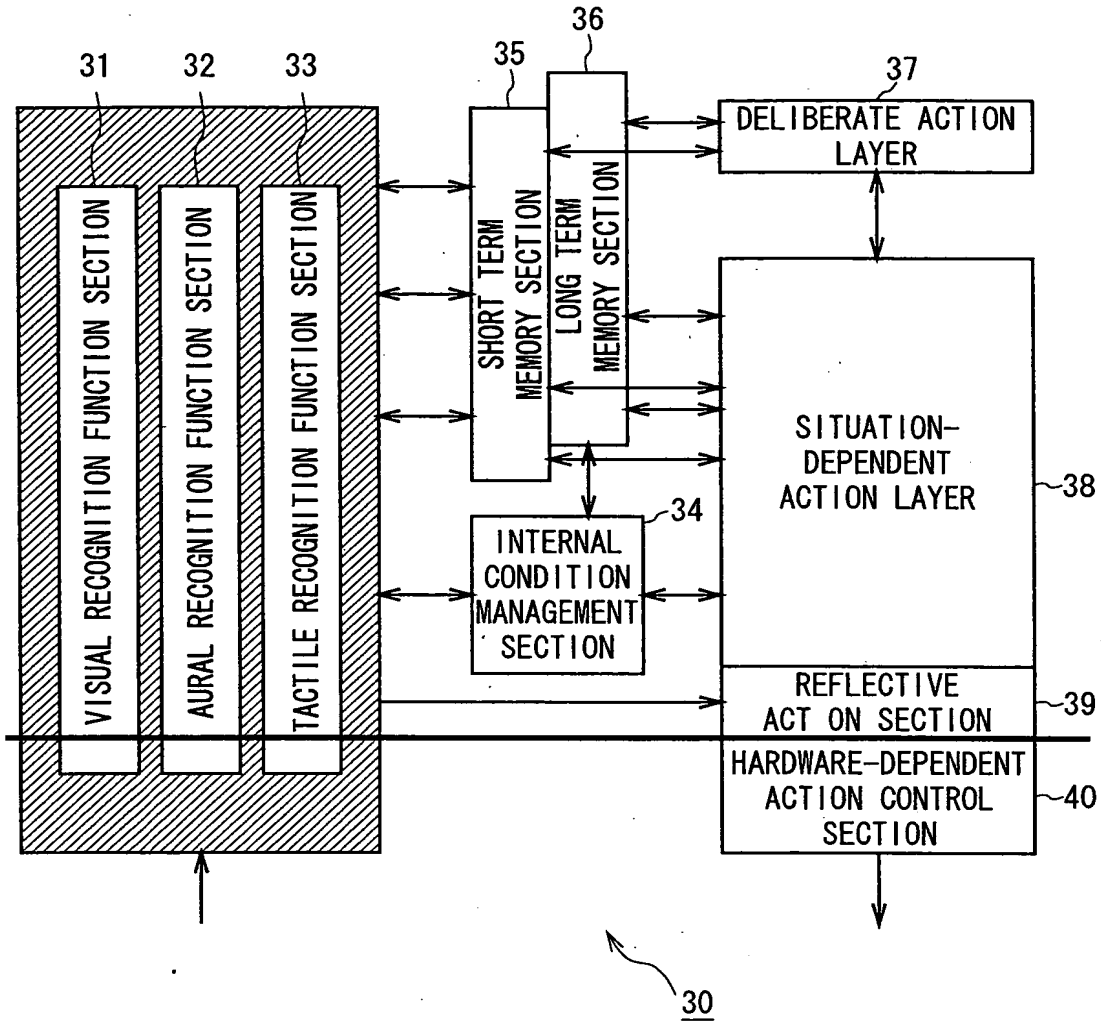
31
32
33
35
36
37
VISUAL RECOGNITION FUNCTION SECTION
AURAL RECOGNITION FUNCTION SECTION
TACTILE RECOGNITION FUNCTION SECTION
SHORT TERM MEMORY SECTION
LONG TERM MEMORY SECTION
DELIBERATE ACTION LAYER
SITUATION-DEPENDENT ACTION LAYER
38
34
INTERNAL CONDITION MANAGEMENT SECTION
REFLECTIVE ACT ON SECTION
39
HARDWARE-DEPENDENT ACTION CONTROL SECTION
40
30

FIG. 3

ID	Name		Kind		FaceID		SpeakerID		BIRTHDAY		Favorite		Friend	
1	YUKIKO	3	HUMAN	2	0	2	1	2	73/5/2	2	TEA	3	KAZUMI	2
2	KAZUMI	1	HUMAN	2	3	3	4	3	75/8/16	5	HORSE	3	TARO	5
3	SUZUKI	5	HUMAN	2	6	3	8	3	74/3/10	2	TEA	3	TARO	2
4	TEA	2	DRINK	2	4	1								
5	ICE CREAM	4	FOOD	3	5	2								
6	TARO	2	HUMAN	3	8	2	9	3	76/10/10	4	HORSE RACING	3	SUZUKI	3

FIG. 4

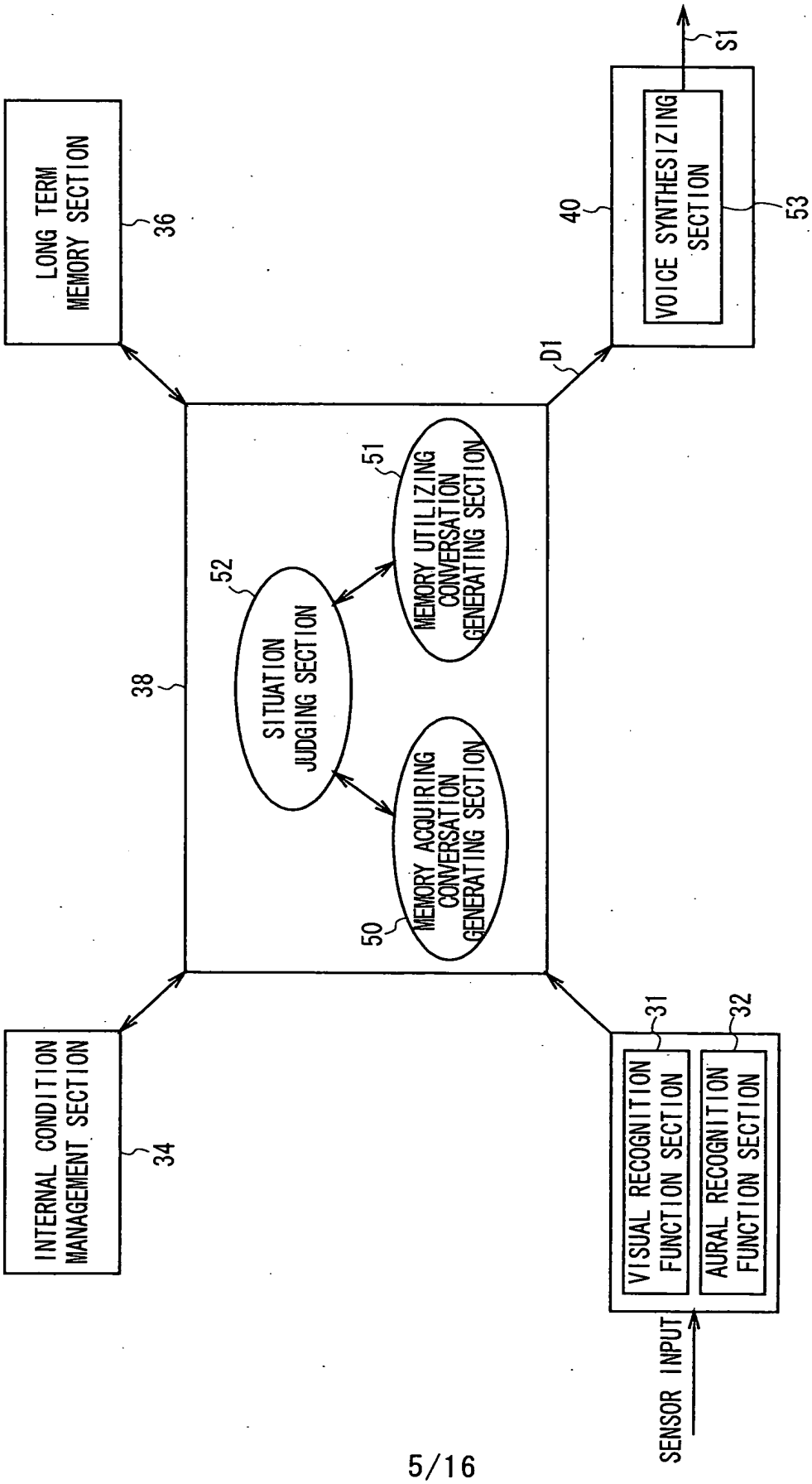
LONG TERM MEMORY SECTION
36
INTERNAL CONDITION MANAGEMENT SECTION
34
38
SITUATION JUDGING SECTION
52
MEMORY UTILIZING CONVERSATION GENERATING SECTION
51
MEMORY ACQUIRING CONVERSATION GENERATING SECTION
50
D1
40
VOICE SYNTHESIZING SECTION
53
S1
VISUAL RECOGNITION FUNCTION SECTION
31
AURAL RECOGNITION FUNCTION SECTION
32
SENSOR INPUT

FIG. 5

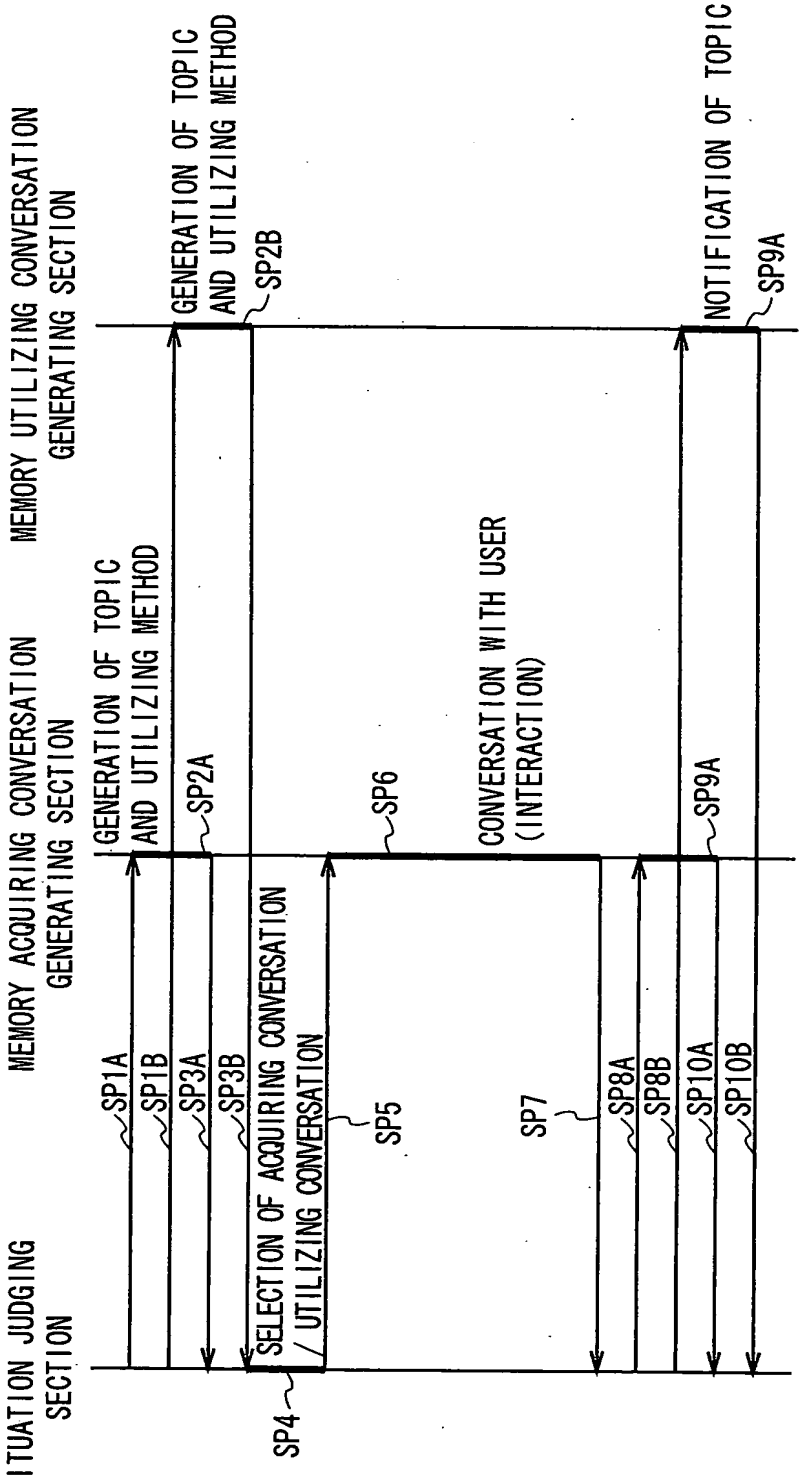
SITUATION JUDGING SECTION
MEMORY ACQUIRING CONVERSATION GENERATING SECTION
MEMORY UTILIZING CONVERSATION GENERATING SECTION
SP1A
GENERATION OF TOPIC AND UTILIZING METHOD
SP1B
SP2B
GENERATION OF TOPIC AND UTILIZING METHOD
SP2A
SP3A
SP3B
SELECTION OF ACQUIRING CONVERSATION / UTILIZING CONVERSATION
SP4
SP5
SP6
CONVERSATION WITH USER (INTERACTION)
SP7
SP8A
SP8B
SP9A
NOTIFICATION OF TOPIC
SP9A
SP10A
SP10B

FIG. 6

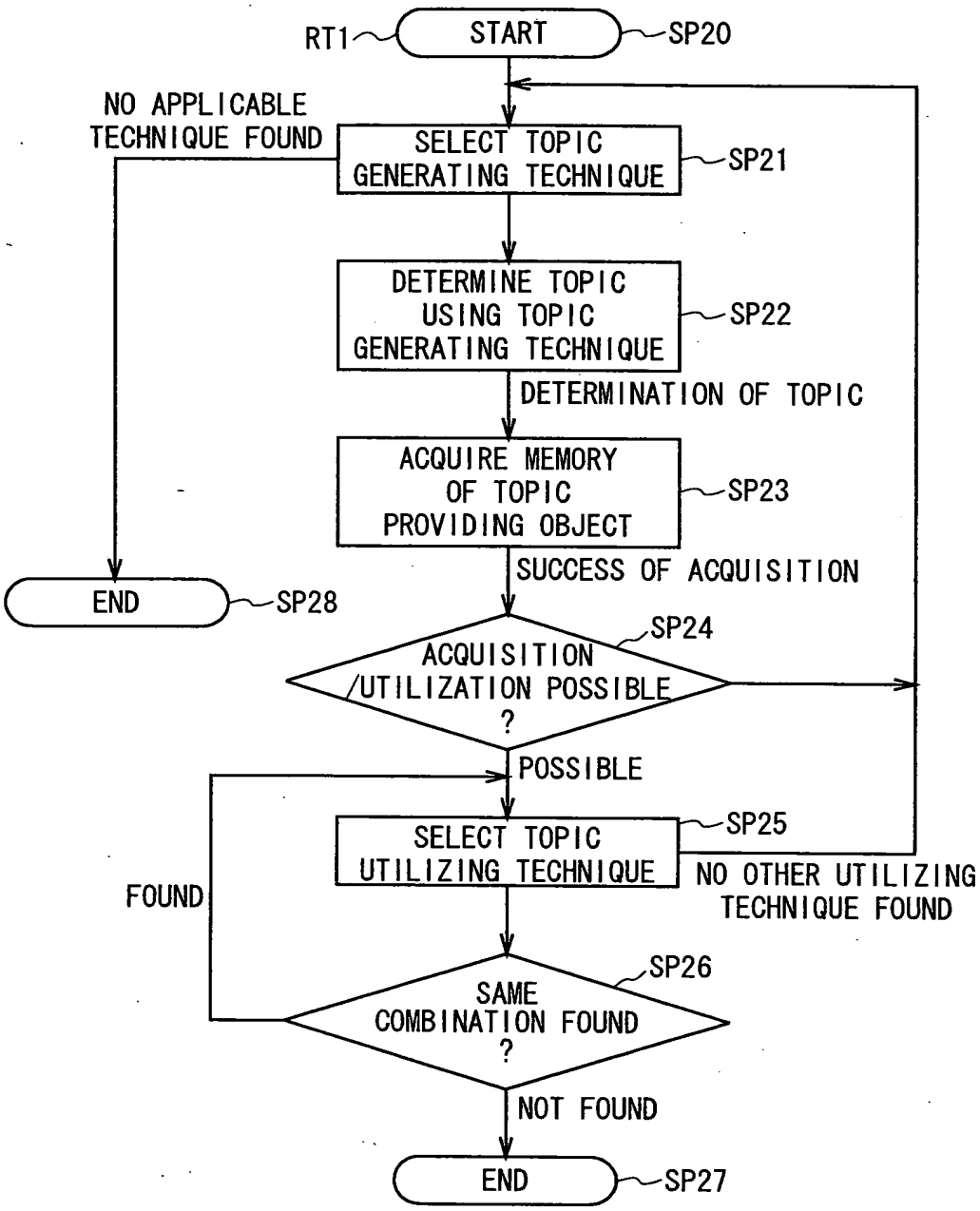
RT1
START
SP20
NO APPLICABLE TECHNIQUE FOUND
SELECT TOPIC GENERATING TECHNIQUE
SP21
DETERMINE TOPIC USING TOPIC GENERATING TECHNIQUE
SP22
DETERMINATION OF TOPIC
ACQUIRE MEMORY OF TOPIC PROVIDING OBJECT
SP23
SUCCESS OF ACQUISITION
END
SP28
SP24
ACQUISITION /UTILIZATION POSSIBLE ?
POSSIBLE
SELECT TOPIC UTILIZING TECHNIQUE
SP25
NO OTHER UTILIZING TECHNIQUE FOUND
FOUND
SP26
SAME COMBINATION FOUND ?
NOT FOUND
END
SP27

FIG. 7

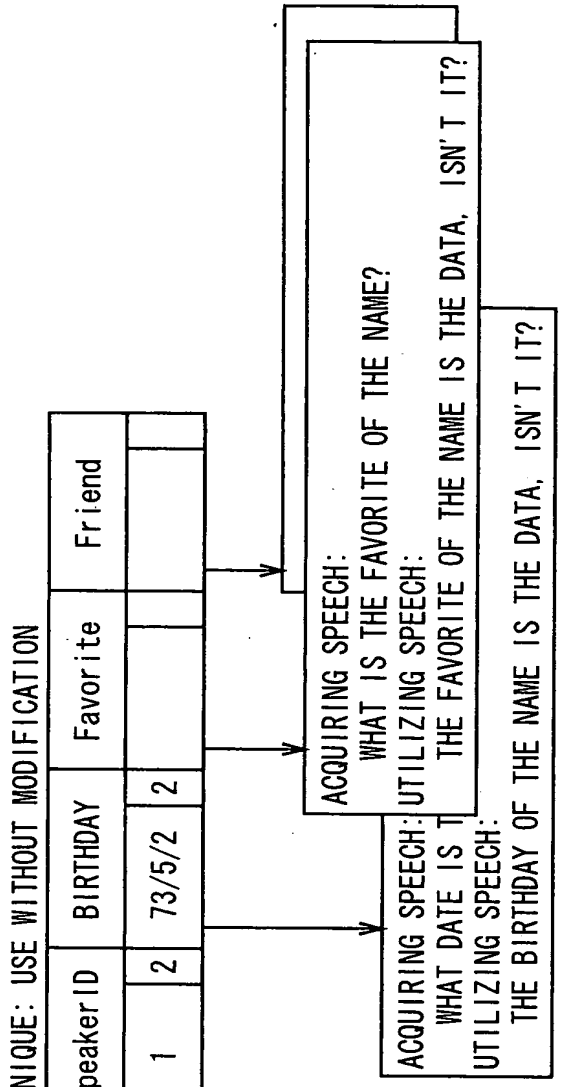
TOPIC: FAVORITE OF ID1 ACQUIRING TECHNIQUE: USE WITHOUT MODIFICATION
ID
Name
Kind
FaceID
SpeakerID
BIRTHDAY
Favorite
Friend
1
YUKIIKO
3
HUMAN
2
0
2
1
2
73/5/2
2
ACQUIRING SPEECH:
WHAT IS THE FAVORITE OF THE NAME?
UTILIZING SPEECH:
THE FAVORITE OF THE NAME IS THE DATA, ISN'T IT?
ACQUIRING SPEECH:
WHAT DATE IS T
UTILIZING SPEECH:
THE BIRTHDAY OF THE NAME IS THE DATA, ISN'T IT?

FIG. 8

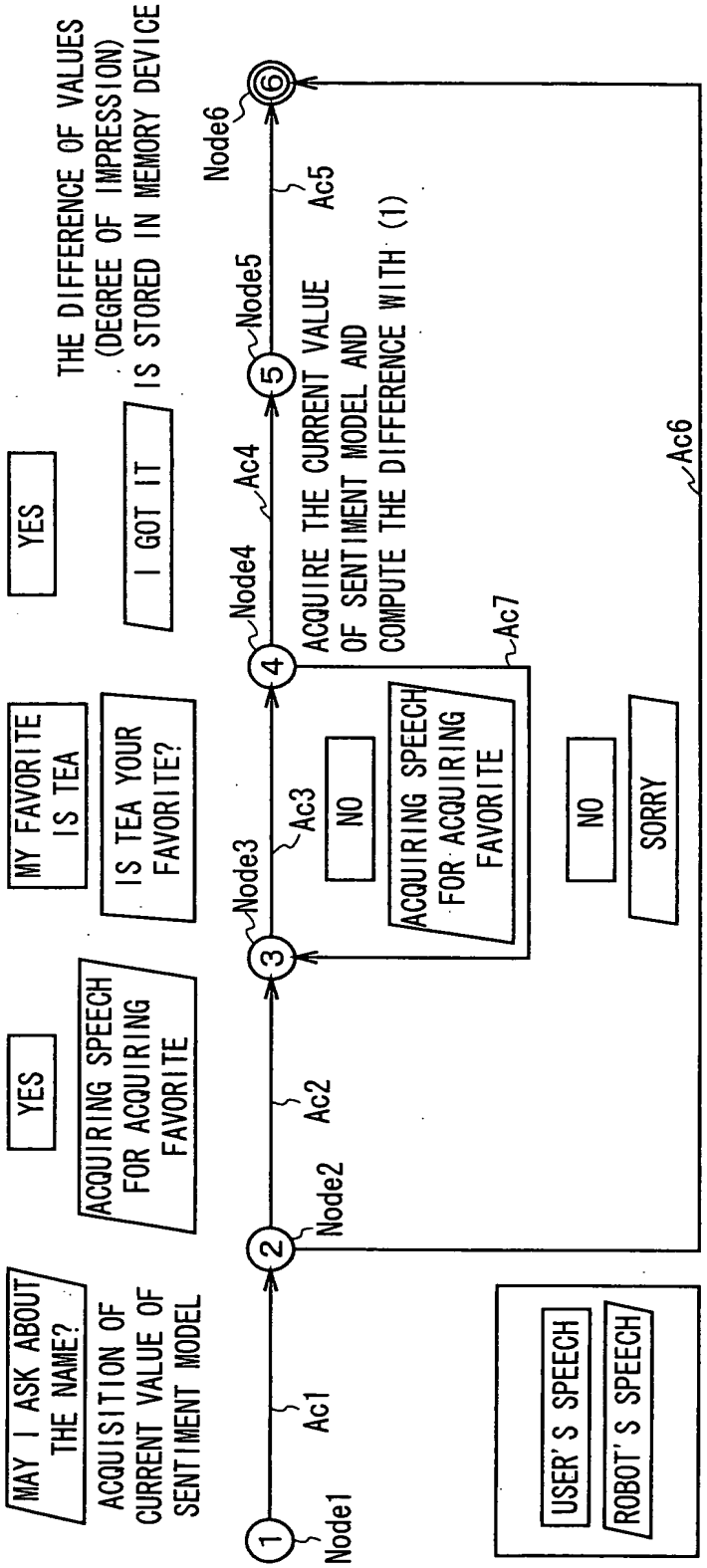
MAY I ASK ABOUT THE NAME?
ACQUISITION OF CURRENT VALUE OF SENTIMENT MODEL
YES
ACQUIRING SPEECH FOR ACQUIRING FAVORITE
MY FAVORITE IS TEA
IS TEA YOUR FAVORITE?
YES
I GOT IT
THE DIFFERENCE OF VALUES (DEGREE OF IMPRESSION) IS STORED IN MEMORY DEVICE
NO
ACQUIRING SPEECH FOR ACQUIRING FAVORITE
NO
SORRY
ACQUIRE THE CURRENT VALUE OF SENTIMENT MODEL AND COMPUTE THE DIFFERENCE WITH (1)
USER'S SPEECH
ROBOT'S SPEECH
Node1
Ac1
Node2
Ac2
Node3
Ac3
Node4
Ac4
Node5
Ac5
Node6
Ac6
Ac7

FIG. 9

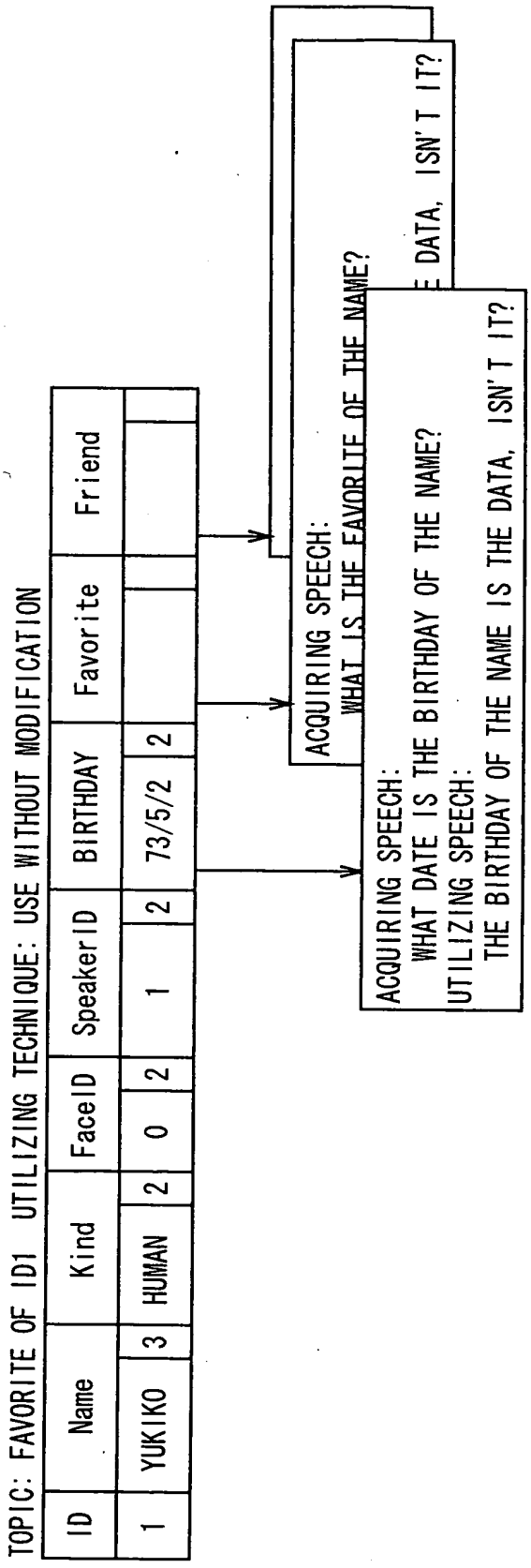
TOPIC: FAVORITE OF ID1 UTILIZING TECHNIQUE: USE WITHOUT MODIFICATION
ID
Name
Kind
FaceID
SpeakerID
BIRTHDAY
Favorite
Friend
1
YUKIKO
3
HUMAN
2
0
2
1
2
73/5/2
2
ACQUIRING SPEECH:
WHAT IS THE FAVORITE OF THE NAME?
ACQUIRING SPEECH:
WHAT DATE IS THE BIRTHDAY OF THE NAME?
UTILIZING SPEECH:
THE BIRTHDAY OF THE NAME IS THE DATA, ISN'T IT?
E DATA, ISN'T IT?

FIG. 10

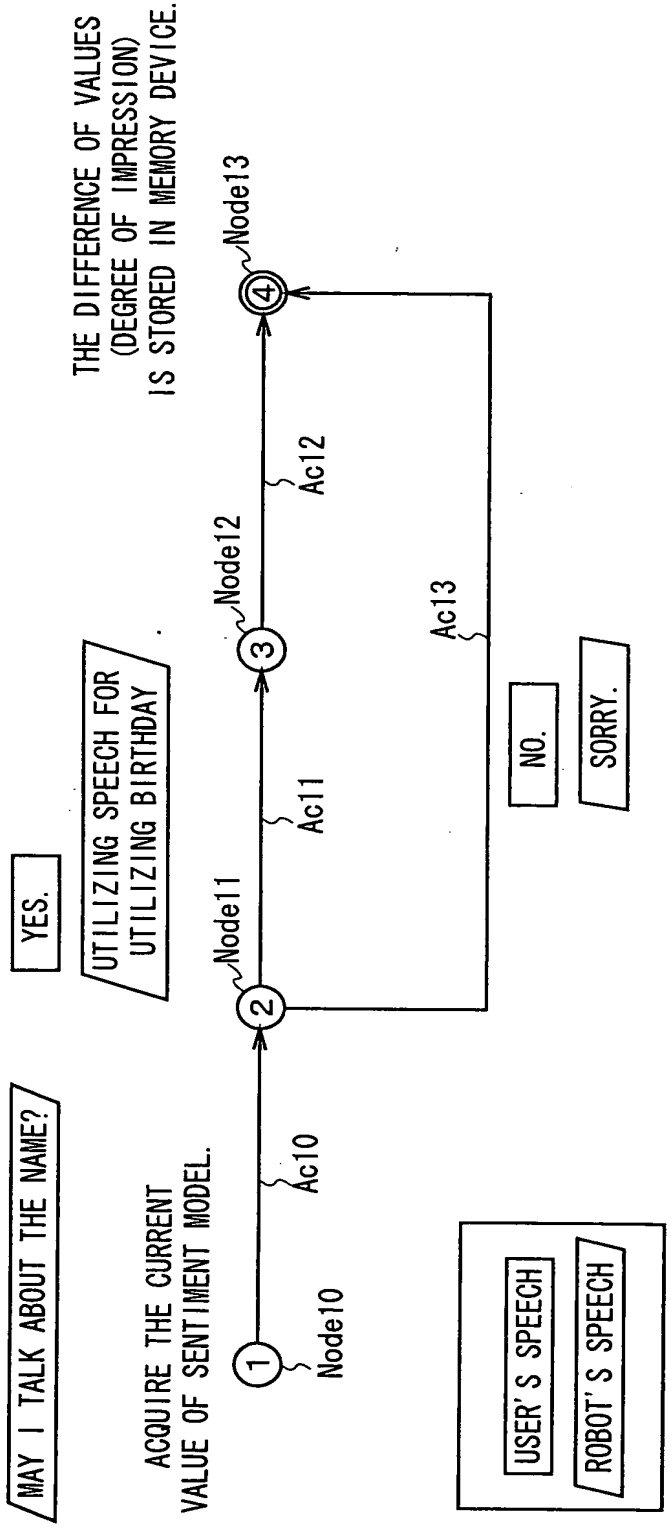
MAY I TALK ABOUT THE NAME?
YES.
UTILIZING SPEECH FOR UTILIZING BIRTHDAY
THE DIFFERENCE OF VALUES (DEGREE OF IMPRESSION) IS STORED IN MEMORY DEVICE.
ACQUIRE THE CURRENT VALUE OF SENTIMENT MODEL.
NO.
SORRY.
Node10
Node11
Node12
Node13
Ac10
Ac11
Ac12
Ac13
USER'S SPEECH
ROBOT'S SPEECH

FIG. 11

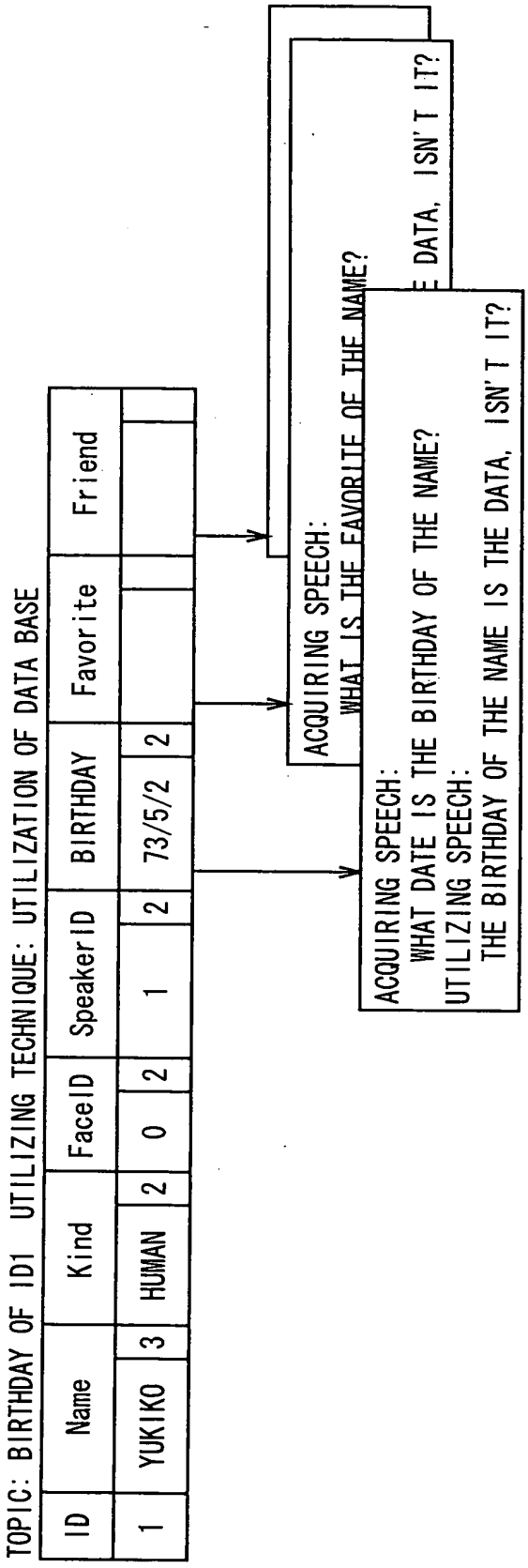
TOPIC: BIRTHDAY OF ID1 UTILIZING TECHNIQUE: UTILIZATION OF DATA BASE
ID
Name
Kind
FaceID
SpeakerID
BIRTHDAY
Favorite
Friend
1
YUKIKO
3
HUMAN
2
0
2
1
2
73/5/2
2
ACQUIRING SPEECH:
WHAT IS THE FAVORITE OF THE NAME?
ACQUIRING SPEECH:
WHAT DATE IS THE BIRTHDAY OF THE NAME?
UTILIZING SPEECH:
THE BIRTHDAY OF THE NAME IS THE DATA, ISN'T IT?
E DATA, ISN'T IT?

FIG. 12

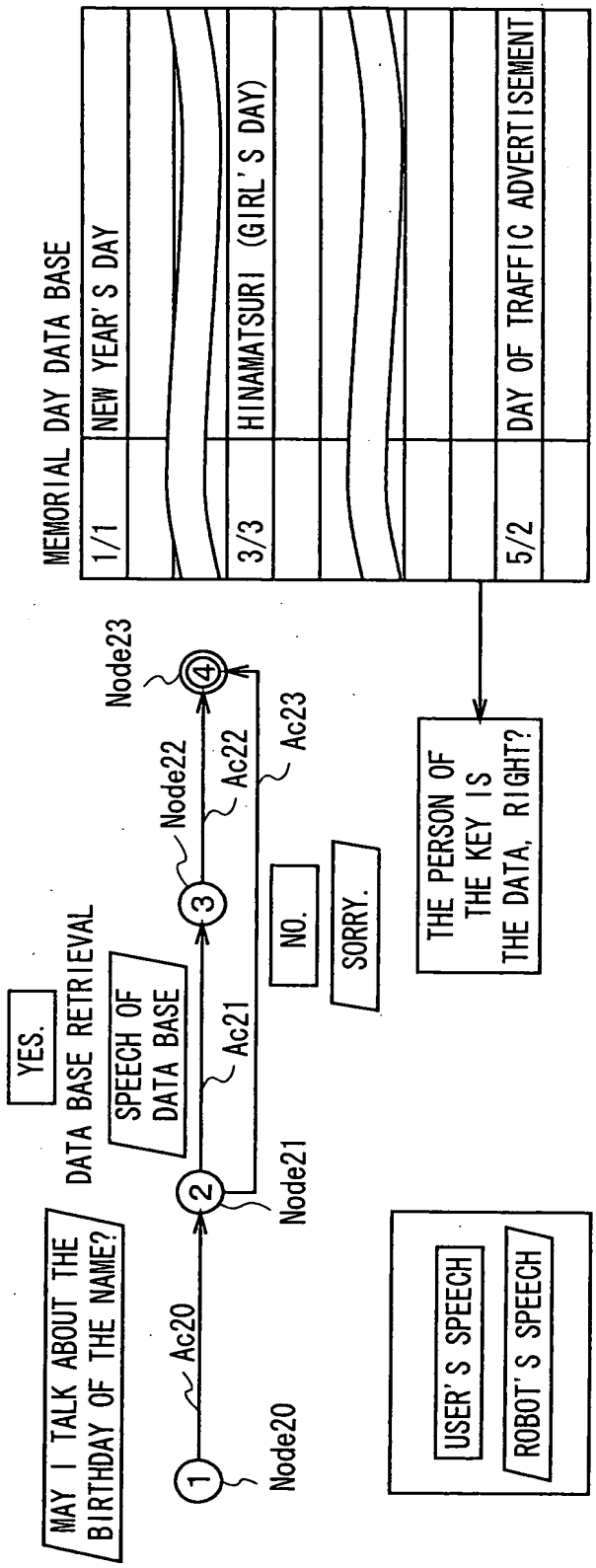
MEMORIAL DAY DATA BASE
1/1
NEW YEAR'S DAY
3/3
HINAMATSURI (GIRL'S DAY)
5/2
DAY OF TRAFFIC ADVERTISEMENT
Node23
Node22
Ac22
Ac23
Ac21
Node21
Ac20
Node20
YES.
DATA BASE RETRIEVAL
SPEECH OF DATA BASE
NO.
SORRY.
THE PERSON OF THE KEY IS THE DATA, RIGHT?
MAY I TALK ABOUT THE BIRTHDAY OF THE NAME?
USER'S SPEECH
ROBOT'S SPEECH

FIG. 13

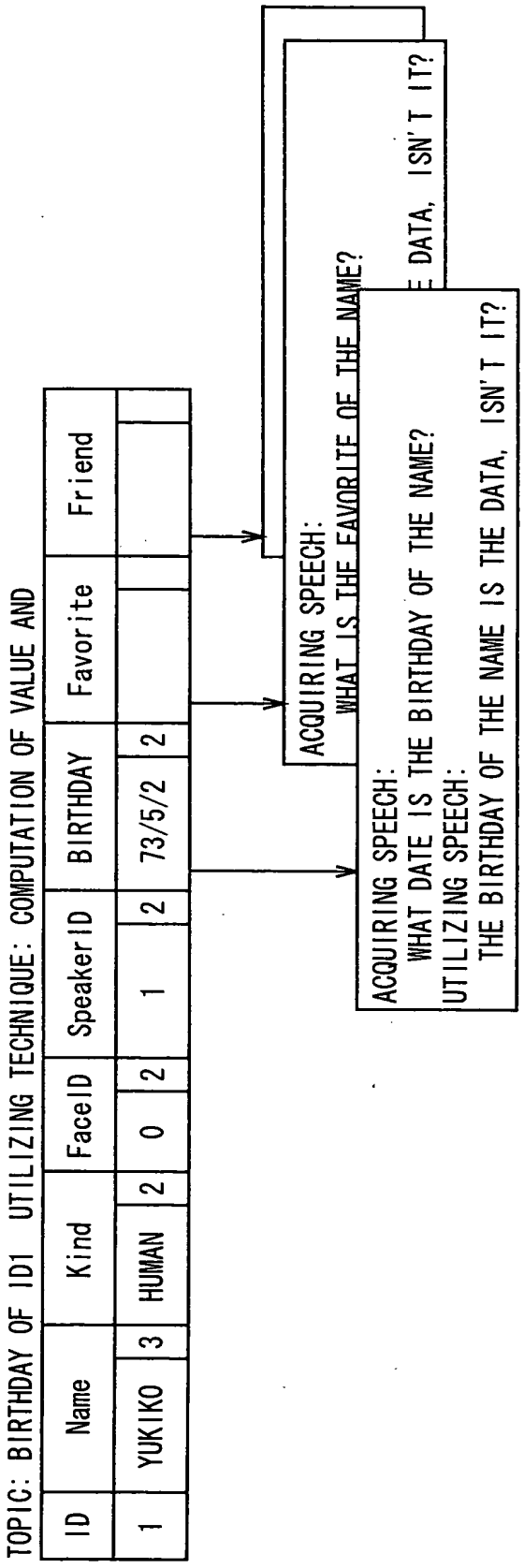
TOPIC: BIRTHDAY OF ID1 UTILIZING TECHNIQUE: COMPUTATION OF VALUE AND
ID
Name
Kind
FaceID
SpeakerID
BIRTHDAY
Favorite
Friend
1
YUKIKO
3
HUMAN
2
0
2
1
2
73/5/2
2
ACQUIRING SPEECH:
WHAT IS THE FAVORITE OF THE NAME?
ACQUIRING SPEECH:
WHAT DATE IS THE BIRTHDAY OF THE NAME?
UTILIZING SPEECH:
THE BIRTHDAY OF THE NAME IS THE DATA, ISN'T IT?
E DATA, ISN'T IT?

FIG. 14

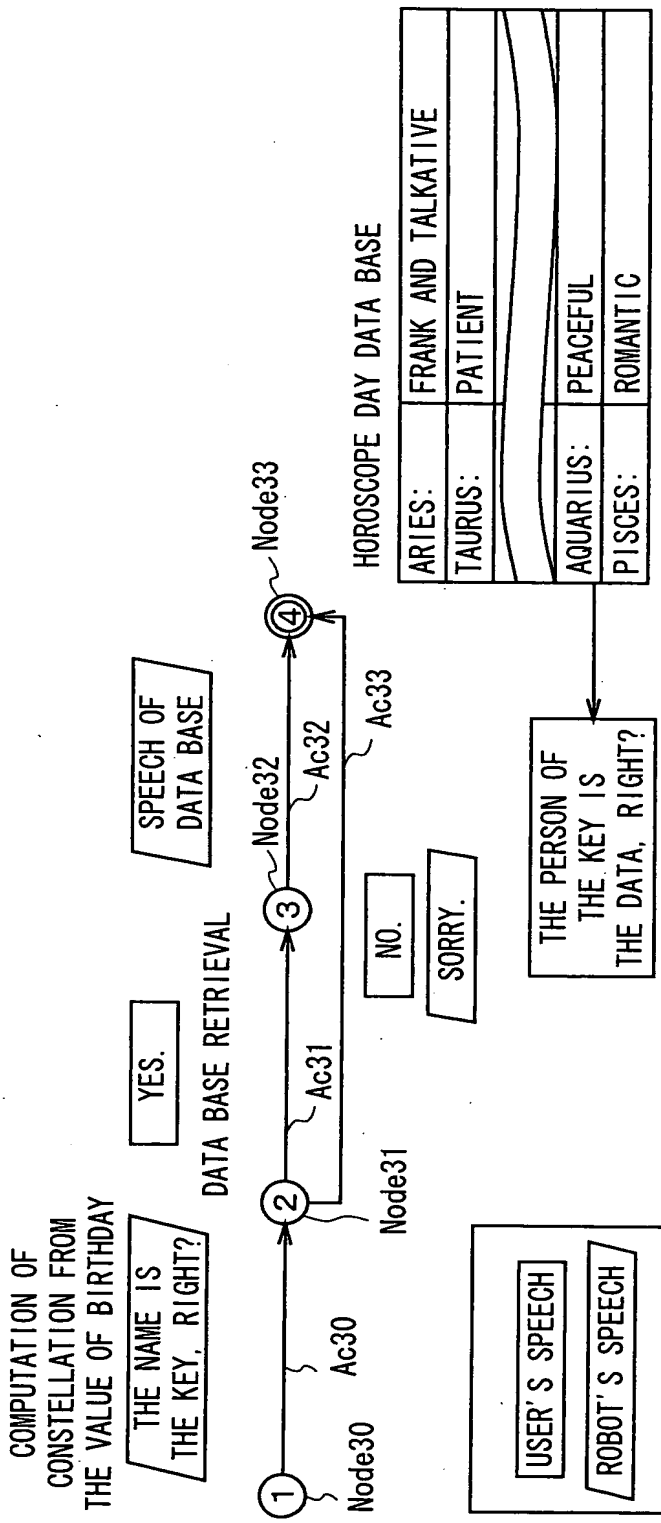
COMPUTATION OF CONSTELLATION FROM THE VALUE OF BIRTHDAY
THE NAME IS THE KEY, RIGHT?
YES.
DATA BASE RETRIEVAL
SPEECH OF DATA BASE
NO.
SORRY.
THE PERSON OF THE KEY IS THE DATA, RIGHT?
USER'S SPEECH
ROBOT'S SPEECH
Node30
Ac30
Node31
Ac31
Node32
Ac32
Node33
Ac33
HOROSCOPE DAY DATA BASE
ARIES:
FRANK AND TALKATIVE
TAURUS:
PATIENT
AQUARIUS:
PEACEFUL
PISCES:
ROMANTIC

FIG. 15

EXPLANATION OF REFERENCE NUMERALS

1...ROBOT, 2...CONTROL UNIT, 10...CCD CAMERA, 11...MICROPHONE, 12...SPEAKER, 21...CPU, 23...ROM, 31...VISUAL RECOGNITION FUNCTION SECTION, 32...AURAL RECOGNITION FUNCTION SECTION, 34...INTERNAL CONDITION MANAGEMENT SECTION, 36...LONG TERM MEMORY SECTION, 38...SITUATION-DEPENDENT ACTION LAYER, 50... MEMORY ACQUIRING CONVERSATION GENERATING SECTION, 51...MEMORY UTILIZING CONVERSATION GENERATING SECTION, 52...SITUATION JUDGING SECTION, 53...VOICE SYNTHESIZING SECTION , D1...CHARACTER STRING DATA, RT1...TOPIC GENERATING PROCESSING SEQUENCE